Lake Michigan Ice Age Trail Plan

Regional Resources Report

Wisconsin Department of Natural Resources
National Park Service
Ice Age Park and Trail Foundation
Bay Lake Regional Planning Commission

February, 2004

Table of Contents

Introduction 1
Planning Background 2
Issues 4
Climate 4
Ecological landscapes 4
  Central Lake Michigan Coastal 5
  Southeast Glacial Plains 5
Geology 5
  Bedrock Geology 7
  Quaternary Geology 7
Topography 8
Soils 9
  General Soils Description 9
  Prime Agricultural Lands 9
Water Resources 9
  Great Lakes Water Levels 9
  Watersheds 11
  Groundwater 13
  Surface Waters 14
  Wetlands 18
ForestS and Woodlands 18
  Point Beach State Forest 19
  Kettle Moraine State Forest – Northern Unit 19
Major Parks, Receration Areas and Open Spaces 19
  State Parks 19
  Recreation Trails 20
  County Parks 21
  Recreational Marinas 23
  Other Local Cultural Resources 23
Scientific and Natural Areas 25
Endangered Resources 27
Environmental Corridors and Isolated Natural Areas 31
Other Local Key Natural Features 32
Historic/cultural and Archeological Resources 32
  Historical Sites 32
Land Use and Land Cover 33
Roads and Highways 33
Demographics 33
  Historical Population Levels 34
  Population Trends and Forecasts 34
  Median Age 34
Maps 36

INTRODUCTION

The Lake Michigan Ice Age Trail planning area covers Kewaunee, Manitowoc, and Sheboygan counties in northeastern Wisconsin. These three counties include eight cities, 21 villages, and 43 towns. The study area totals 1,760 square miles, includes over 87 miles of coastal shoreline along Lake Michigan, and contains eight major watershed areas that drain into the waters of Lake Michigan (Map 1). The 2000 population of the area was 210,410 persons.

From recreational activities with long traditions, like hunting, ice fishing, camping, and cross-country skiing, to newer pursuits, like in-line skating and mountain biking, Wisconsin is rich in outdoor recreation opportunities, and year round participation in these activities is on the rise.

Outdoor recreation aids citizens' physical health, as well as the health of the economy, as high-quality recreation opportunities attract thousands of visitors to the state each year. As a new century begins, outdoor recreation providers need to consider the events and issues that may influence outdoor recreation in the future:

- Land use patterns are shifting,
- Ownership patterns in rural areas are changing,
- Budgets for operation and maintenance of recreation resources are not expected to increase, and
- The demographics of the state are shifting.

According to the U.S. Census, the number of Wisconsin residents aged 40 to 49 increased from 595,000 to 838,000 between 1990 and 2000, a gain of 41 percent. As people age their recreational patterns may change. The changes in family structure also challenge recreation providers to consider the needs of single-parent families.

The first designated Wisconsin State Park was Interstate Park at The Dalles of the St. Croix River. Since then, Wisconsin's State Parks System has grown to include 93 state parks, forests, trails and recreation areas. The Wisconsin Department of Natural Resources also manages many thousands of acres of land open to public recreation through wildlife areas, fishery areas, state forests, flowages and state natural areas for a total of about 1.3 million acres available to the public for outdoor recreation. County, local and federal governments also manage 5.5 million acres of land available for public outdoor recreation.

When the DNR updated its Strategic Plan in 1999, it named providing outdoor recreation one of four primary goals of the plan. The Warren Knowles-Gaylord Nelson Stewardship Program provides funds for state land acquisition, including recreational land, and establishes grants for land acquisition and development of recreation re sources available to local units of government and non-profit conservation organizations. Each of these efforts strengthens the commitment to outdoor recreation in Wisconsin.

As part of the planning process for the Ice Age Trail, the Park Service has worked with other agencies and citizens to develop a vision for the trail. The vision is expressed in a set of goals for trailway planning. These goals include the concept that the Ice Age Trail is a continuous footpath through diverse landscapes that:

- Provides superlative outdoor recreation experiences;

- Preserves and commemorates world renowned geological features formed during the Wisconsin Glaciation;
- Provides a natural corridor that protects habitat and enables the movement of wildlife;
- Serves as a lifelong educational resource;
- Provides quiet places for people to form and nurture a spiritual connection with the landscape;
- Promotes the health and vigor of users of all ages and abilities, and
- Links the history and diverse human cultures of the land that we call Wisconsin.

In addition, the Lake Michigan Ice Age Trail segment has several added goals:

- The trail will be developed in visually pleasing corridor that includes scenic vistas;
- The trail will provide access to the Lake Michigan shoreline, where possible;
- The trail will offer links to the Wisconsin Maritime Trails System;
- The trail will link significant resource areas;
- The trail will traverse through a variety of plant communities.

PLANNING BACKGROUND

Wisconsin's efforts to preserve its Ice Age features began in the 1950's. A proposal for the establishment of a National Park showcasing Wisconsin's glacial features was formulated in the 1950's through the efforts of the late Raymond T. Zillmer, a Milwaukee attorney. In 1958, he and others formed the Ice Age Park and Trail Foundation to work for the establishment of the an "Ice Age Glacier National Forest Park." The result of this effort was the authorization by Congress in 1964 of an Ice Age National Scientific Reserve that included nine units to be administered by the State of Wisconsin in cooperation and assistance from the National Park Service.

In 1980, the National Park Service designated an Ice Age National Scenic Trail (NST) to connect the nine reserves by a continuous footpath. The purpose of the Ice Age NST, as a companion project to the Reserve, includes preserving some of the finest features of Wisconsin's glacial landscape, as well as other scenic and natural resources, while providing opportunities for low impact recreational educational use.

The NPS is responsible for overall administration of the Ice Age NST. In 1983, the NPS completed a Comprehensive Management Plan for the trail. The plan provides overall guidance for development and management of the trail, which is intended to be a partnership venture, accomplished through many cooperating Federal, State, and local agencies and private trail organizations. The primary cooperators are the WDNR and the IAPTF. A Memorandum of Understanding (MOU) between these parties outlines their respective roles and responsibilities for the acquisition, development, operation, maintenance, and protection of the trail.

More than 190 miles of trail are located on WDNR properties. The WDNR assists in planning and implementing the Ice Age NST, provides grants to the IAPTF and others for acquisition and maintenance of the trail, and acquires and accepts gifts of land for the trail.

The IAPTF develops and maintains the trail and its associated lands, assists in planning and acquiring lands for the trail, raises money to support the trail, and generally promotes and sponsors the trail.

Local Planning Background

The search for a location of the Ice Age NST in Sheboygan, Manitowoc and Kewaunee Counties began in the 1970's by individuals and organizations within the region. By 1990 a trail had been established by a network of volunteers within Manitowoc County primary along county and township roads. This trail ran along a North - South corridor connecting such features as Mishicot esker, Tisch Mills esker, Camp Tapawingo, and sections of the East Twin River. Over the years the location and use of this trail segment has been lost do to the reduced efforts of the local volunteers.

Within Sheboygan County, consideration was given to the Sheboygan Marsh for inclusion as an Ice Age Reserve Unit. While this was not established, this area is still considered an important geological and recreational feature. In 1971, the Glacial Trail in the Kettle Moraine State Forest Northern Unit was designated a National Scenic Trail. In 1983, the Glacial Trail was incorporated and dedicated into the Ice Age National Scenic Trail System that includes 20 miles of trail within Sheboygan County.

Ice Age NST was established in Kewaunee County after the State of Wisconsin acquired the trailbed in 1970. The Ahnapee State Trail currently has 14 miles of Ice Age NST established (10 miles which are not certified), In addition, the county has 2 miles of trail in Bruemmer County Park and 1mile or trail north of Tisch Mills. These sections were established by the Kewaunee Ice Age Foundation Chapter.

ISSUES

Because the project area for the Lake Michigan Ice Age Trail covers portions of Sheboygan, Manitowoc and Kewaunee Counties, it poses several unique challenges in the identification of trail corridors and alternatives. These challenges begin with the basic problem of how to get from the Kettle Moraine area of northwestern Sheboygan County to the Ahnapee Trail in southeastern Kewaunee County. One immediate problem is posed by the need to cross the Sheboygan River and State Highways 57 and 67 as the trail enters Manitowoc County from Sheboygan County. One of the largest challenges is in determining how to cross Manitowoc County from south to north. The overall landscape of the county is defined by the Manitowoc, East and West Twin Rivers and other valleys that tend to flow from the west and northwest towards the eastern part of the county. These valleys offer striking views of the landscape and are primarily formed by glacial meltwater.

Another challenge is posed by Interstate Highway 43 which traverses central Manitowoc County from the south to the northwest and must be crossed by the trail. Crossing to the east side of I-43 is required to connect with the Ahnapee Trail in Kewaunee County and can potentially provide the trail with its closest access to Lake Michigan. Making a connection to Lake Michigan is considered to be an important component of the Ice Age Trail in this area.

CLIMATE

The study area typically experiences continental weather with some modification by Lake Michigan. The cool waters of the lake delay spring, while relatively warm water in fall retards early frost. Summers, on average, are mild due to the study area's proximity to water that moderates daily extremes. Average temperatures range from a low of 6 - 10 degrees Fahrenheit in January to a high of 78 - 81 degrees Fahrenheit in August.

About two-thirds of the annual precipitation falls during the growing season. It is normally adequate for vegetation, although drought is occasionally reported. The climate is most favorable for dairy farming; the primary crops are corn, small grains, hay, and vegetables.

The growing season averages 130 to 150 days. The average date of last spring freeze varies from the first week to the last week of May. The first autumn freezes occur in early to mid-October.

The long-term mean annual precipitation ranges from 31 to 32 inches over most of the study area. Ice forms on Green Bay in late December and generally covers the bay by mid-January. During mild winters, the bay may not freeze completely. Ice breakup usually occurs in early April.

The average seasonal snowfall varies from 55 inches in the north to 48 inches in the south. The mean dates of first snowfall of consequence, an inch or more, occur in early November. The snow cover acts as protective insulation for grasses, autumn seeded grains, and other vegetation.

The approximate humidity conditions for the study area in winter ranges from an average nighttime maximum of about 80 percent to a daytime minimum of about 70 percent. Relative humidity in the summer averages 85 percent at night and 60 percent in the daytime.

ECOLOGICAL LANDSCAPES

The Wisconsin DNR has mapped Wisconsin into areas of similar ecological potential and geography into units known as Ecological Landscapes (Map 2). This classification is based on aggregations of subsections from the National Hierarchical Framework of Ecological Units (NHFEU) (Avers et al. 1994). The NHFEU and the Ecological Landscape systems delineate landscapes of similar ecological pattern and potential across the state in a way that is meaningful and useful to resource administrators, planners, and managers.

The study area falls into two of these Ecological Landscapes or Eco-Study areas. These include:

Central Lake Michigan Coastal

The Central Lake Michigan Coastal Ecological Landscape stretches from southern Door County west across Green Bay to the Wolf River drainage, then southward in a narrowing strip along the Lake Michigan shore to central Milwaukee County. Summers are cooler, winters are warmer, and precipitation levels are greater in the eastern part of this landscape than at locations farther inland, owing to the influence of Lake Michigan. Dolomites and shales underlie the glacial deposits that blanket virtually all of the Central Lake Michigan Coastal Ecological Landscape. The dolomite Niagara Escarpment is the major bedrock feature, running across the entire landscape from northeast to southwest. Series of dolomite cliffs provide critical habitat for rare terrestrial snails, bats, and specialized plants. The primary glacial landforms are ground moraine, outwash, and lakeplain. The topography is generally rolling where the surface is underlain by ground moraine, variable over areas of outwash, and nearly level where lacustrine deposits are present. Important soils include clays, loams, sands, and gravels. Certain landforms, such as sand spits, clay bluffs, beach and dune complexes, and ridge and swale systems, are associated only with the shorelines of Lake Michigan and Green Bay. Today approximately 84 percent of this Ecological Landscape is non-forested. The remaining forest consists mainly of mesic maple-basswood or maple-beech types, or lowland hardwoods composed of soft maples, ashes, and elms.

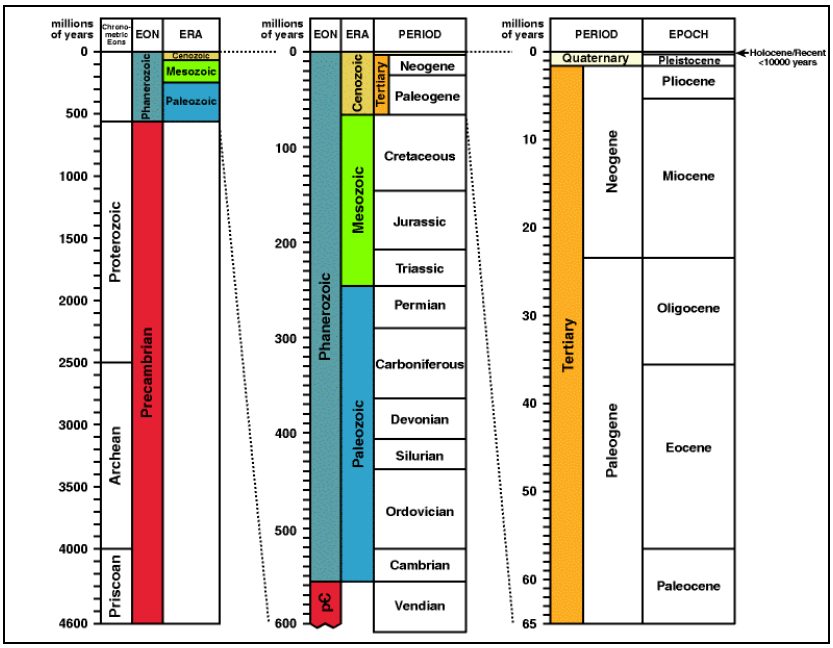
Southeast Glacial Plains

The Southeast Glacial Plains Ecological Landscape makes up the bulk of the non-coastal area in southeast Wisconsin. This landscape is made up of glacial till plains and moraines composed of glacial materials deposited during the Wisconsin Ice Age. Agricultural and residential uses have significantly altered the historic vegetation. Most of the rare natural communities are associated with the Niagara Escarpment or large moraines. Agriculture and urban land uses predominate with forested areas only occupy about 10 percent of the area.

GEOLOGY

Two different types of geologic settings, Quaternary geology and bedrock geology, characterize the study area. Quaternary geology refers primarily to the effects that continental glaciations have had on the study area within the last 20,000 years, and to a lesser extent, the surface effects of more recent erosion and deposition. Bedrock geology refers to the much older, solid rock layers that lie beneath Quaternary sediments. Figure 1 and 2 illustrate the time span for each of these geologic time periods.

Figure 1: Geologic Time Scale



Source: Dr. Andrew MacRae, The University of Calgary, Dept. of Geology and Geophysics, 1996.

Figure 2: Geologic Eras

CENOZOIC ERA (Age of Recent Life)	Quaternary Period	The several geologic eras were originally named Primary, Secondary, Tertiary, and Quaternary. The first two names are no longer used. Tertiary and Quaternary have been retained but used as period designations.
	Tertiary Period	
MESOZOIC ERA (Age of Medieval Life)	Cretaceous Period	Derived from Latin word for chalk (creta) and first applied to extensive deposits that form white cliffs along the English Channel.
	Jurassic Period	Named for the Jura Mountains, located between France and Switzerland, where rocks of this age were first studied.
	Triassic Period	Taken from the word "trias" in recognition of the threefold character of these rocks in Europe.
PALEOZOIC ERA (Age of Ancient Life)	Permian Period	Named after the province of Perm, U.S.S.R., where these rocks were first studied.
	Pennsylvanian Period	Named for the State of Pennsylvania where these rocks have produced much coal.
	Mississippian Period	Named for the Mississippi River Valley where these rocks are well exposed.
	Devonian Period	Named after Devonshire, England, where these rocks were first studied.
	Silurian Period	Named after Celtic tribes, the Silures and the Ordovices, that lived in Wales during the Roman Conquest.
	Ordovician Period	
	Cambrian Period	Taken from the Roman name for Wales (Cambria) where rocks containing the earliest evidence of complex forms of life were first studied.
PRECAMBRIAN	----------	The time between the birth of the planet and the appearance of complex forms of life. More than 80 percent of the Earth's estimated 4-1/2 billion years falls within this era.

Source: USGS, *Geologic Time*, 1997.

Bedrock Geology

The bedrock units, which underlie the study area, range in age from Precambrian at depth to Silurian at the surface (Map 3).

In the study area, these rocks are overlain by consolidated sedimentary rocks of Cambrian, Ordovician, and Silurian ages. These sedimentary rocks are solidified marine sediments that dip to the southeast towards the center of Michigan at approximately 45 feet per mile.

Silurian dolomite, often referred to as Niagara, is the uppermost bedrock in the southern portion of the study area and is exposed in outcroppings along the bluffs near the waters of Green Bay. This dolomite reaches thicknesses up to 580 feet.

Rocks underlying the Niagara dolomite are not visible in the study area. Below the Niagara dolomite is a shale formation known as Maquoketa. It reaches a maximum thickness of 450 feet. The Maquoketa Shale overlies a dolomite formation, termed Platteville-Galena, which is approximately 500 feet in thickness. This rock formation, in turn, overlies Cambrian sandstones, which are 450 feet thick. All of these sedimentary rock formations overlie Precambrian igneous rocks.

The Silurian or "Niagara" dolomite is perhaps the most notable bedrock unit within the study area. The rock dips gently to the southeast and is best exposed along the northern shore of Green Bay as a 60 to 90 foot cliff outside the study area known as the Niagara Escarpment.

Quaternary Geology

The last glacial ice of Quaternary glaciation, which left the planning area approximately 10,000 years ago, modified the bedrock surface by scouring highlands and depositing this material in lowlands created by pre-glacial erosion. Four types of Quaternary deposits are recognized within the study area (Map 4). These include till, glaciofluvial sediments, shoreline deposits and organic deposits.

Till or unstratified drift is a mixture of unsorted, angular- to round-shaped sediments ranging in size from clay to boulders. Tills are ice-contact deposits originating directly from glacial ice.

Unlike till, glaciofluvial sediments are sorted by particle size that delineates the stratification. Glaciofluvial sediments were deposited in a fluvioglacial environment involving glacial meltwater flow. Each individual layer of glaciofluvial sediments are characterized by a given grain size, ranging from pebbles and cobbles to sand or finer.

There are two types of topographic landforms that consist primarily of till found in the study area. They are ground and end moraines. A ground moraine is an irregular surface of till, which was deposited by a receding glacier. The steeper slope points in the direction from which the glacier advanced. An end moraine is an accumulation of earth, stones, and other debris deposited at a glacier’s end stage.

At least one type of topographic landform consisting of glaciofluvial sediments occurs in some areas of the planning area. This type of topographic feature is an outwash plain, which is an apron of well sorted, stratified sand and gravel deposited by glacial meltwater. Glaciofluvial deposits which contained large ice blocks that eventually melted were pitted with depressions known as kettles. Glaciofluvial deposits of sand and gravel surround many drumlins; but these are often covered with a thin silt cap.

The most prominent ancient shoreline in the area is that of the Nipissing Great Lakes phase, which usually occurs at an elevation of 600-605 feet above sea level. The highest ancient shoreline in the area is that of the Algonquin phase, which occurs at elevations between 620 and 658 feet above sea level.

Within the Lake Michigan Ice age study area, there are several glacial features of note. According to the *Geology Field Guide to Wisconsin and Upper Michigan,* one of the primary features that traverses Sheboygan, Manitowoc and Kewaunee counties is the Kettle Interlobate Moraine. This moraine is "an irregular ridge formed when the Green Bay and Lake Michigan glacial lobes stagnated in juxtaposition during the Woodfordian ice advance. It forms the glacial backbone of eastern Wisconsin as it trends north-northeast from Walworth County to Brown County." The Sheboygan River drains part of the northern Kettle Interlobate Moraine as does the Manitowoc River. The guide also indicates that the southwestern portion of Manitowoc County is covered with 'Gray Woodfordian Drift' which has been also described as Valderan Drift. The eastern edge of the three counties is primarily composed of 'Ancestral Lake Michigan' deposits from Sheboygan County to just north of Two Rivers in Manitowoc County, and Valderan Drift from Two Rivers north encompassing most of Kewaunee County.

The report identifies three small eskers in northeastern and western Manitowoc County. One small esker is located near the village of Mishicot while a larger esker is noted just west of I-43 north of Highway 10.

The report highlights Maribel Caves County Park due to the caves being formed by solution enlargement along vertical cracks in Silurian dolomite. These cracks were enlarged by the West Twin River as it deepened its course through the bedrock. These caves are especially noteworthy since they are rare features in glaciated part of Wisconsin.

The steep cliff-like dolomite face the caves occur in is also significant. The dolomite cliff is the west wall of a channel cut by water flooding out of glacial Lake Oshkosh across the Niagara Escarpment to the Lake Michigan basin. Many of the small oversize stream valleys in Manitowoc and Kewaunee Counties were formed when this meltwater flowed from the receding glaciers. The east wall of the channel is clearly visible about a mile to the east. The entire channel is best seen driving east on Highway 147. As the Green Bay Lobe receded from the area a series of lower and lower outlets for glacial Lake Oshkosh were opened across the escarpment to the Lake Michigan basin. First the Manitowoc River Valley, then the Neshota/West Twin River Valley, then the Kewaunee River Valley, then the Ahnapee River Valley, and finally the Sturgeon Bay lowland.

TOPOGRAPHY

The topography of the three counties is defined by gently rolling landscape leading to Lake Michigan. Most of the western portions of Sheboygan and Manitowoc Counties are fairly flat expanses of open land with gentle hills that slowly descend to the east (Map 5). The eastern portion of these two counties and all of Kewaunee County are typified by river valleys with steep slopes and hills that drain towards Lake Michigan. All three counties have bluffs adjacent to Lake Michigan increasing in height from southern Sheboygan County northward to Kewaunee County. Bluffs in northern Sheboygan and southern Manitowoc County range in height from 10 to 30 feet while in northern Kewaunee County they range up to 30 to 40 feet above the lake.

SOILS

General Soils Description

Soil is composed of varying proportions of sand, gravel, silt, clay, and organic material. The composition of a soil affects the specific properties of that soil. These properties must be evaluated prior to any development. The general character of soils is largely the result of various glacial depositional processes. Outwash soils were formed from glacial deposits which were derived from local bedrock formations. Organic soils developed under a forest cover consisting mainly of conifers and hardwoods in the north in a cool and relatively moist climate. Sandy soils were formed from parent materials derived from sandstone bedrock pulverized by glacial ice.

Soils, in part, determine how much rainfall or snowmelt directly flows into the rivers, lakes, and wetland, and how much infiltrates the ground. Water that infiltrates the ground replenishes soil moisture and recharges the groundwater system. Soils are grouped into general soil associations that have similar patterns of relief and drainage. These associations typically consist of one or more major soils and some minor soils. The general soil types can be divided into three broad categories: areas dominated by soils formed in glacial till; areas dominated by soils formed in glacial outwash and till; and, areas dominated by organic soils. Within the study area, there are 27 different soil associations.

The soils in the study area are diverse ranging from sandy loam to loam or shallow silt loam, and from poorly drained to well drained (Map 6). In some areas, lacustrine sands are found overlying clays or bedrock within only a few feet of the surface. Poorly drained sands are common in the lake plain or in depressions between dunes and beach ridges. Important soils in the study area include clays, loams, sands, and gravels.

Prime Agricultural Lands

The USDA, Natural Resources Conservation Service defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland includes land that is being used currently to produce livestock and timber. It does not include land already committed to urban development or water storage.

Two classes of prime farmland are identified; those areas that are considered prime farmland at all times and those areas that are considered prime farmland only where drained. The rest of the study area is classified as not prime farmland. Within the study area, much of the central and western portions of the three counties are considered to be prime farmland (Map 7). The northeastern portion of Manitowoc County has shallow soils making it less suitable for agricultural uses.

WATER RESOURCES

Great Lakes Water Levels

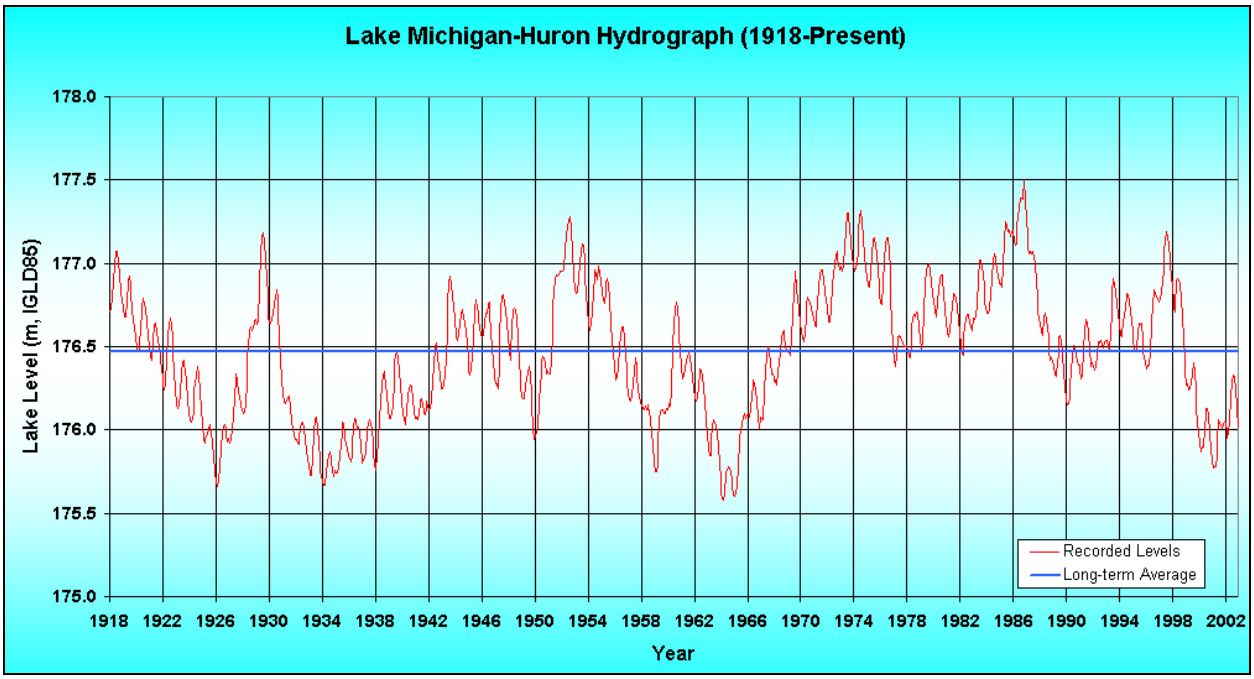
The last several years have seen a dramatic drop in the water levels of Lake Michigan and the bay of Green Bay. The drop in water levels has had a significant effect on the use of the bay and rivers feeding to it. With lower water levels, more of the shoreline is exposed and wet areas become dry. In December 1999, the water level of lakes Michigan and Huron continued to

decline, passing the Low Water Datum elevation of 577.5 feet above the International Great Lakes Datum of 1985.

According to the US Army Corps of Engineers (Detroit District), evaporation is blamed for much of the drop in lake levels over the past few years. Warmer-than-average water temperatures have occurred in the past few summers. This has caused greater than average evaporation of lake water when the cold winds of fall arrive. Brisk, dry, cold winds blowing over exposed warmer waters hastens evaporation and lowers water levels. According to the Corps, lakes Michigan and Huron lose about 2.5 centimeters (one inch) of water a week to evaporation in October. If an unusually cold air mass settles over a much warmer lake, the same amount of evaporation, or more, may occur in just a few days. Since lakes Michigan and Huron rise and fall together, a drop of one inch in water level is a loss of about 784 billion gallons of water from these two lakes to the atmosphere.

On June 6, 2003 the water level was nine inches below the chart datum of 577.5 feet (IGLD 1985). This level is 24 inches below the long-term average lake level for the date, but still slightly more than eight inches above the lowest average water level of this century; a record set in 1964. On average, the minimum seasonal water level of these lakes occurs in February.

Figure 3: Lake Michigan/Huron Historic Water Levels, 1918-2002



Source: US Army Corps of Engineers, 2003.

Watersheds

A watershed can be defined as an interconnected area of land draining from surrounding ridge tops to a common point such as a lake or stream confluence with a neighboring watershed. All lands and waterways can be found within one watershed or another.

The study area encompasses some of the most scenic and critical watersheds within Wisconsin (Map 8). All the watersheds in the study area drain into the Lake Michigan Watershed either

through major rivers or by direct drainage to the lake. These watersheds have been classified as either Priority or Non-Priority watersheds for water quality purposes by the Wisconsin Department of Natural Resources. The Sheboygan River has been designated as a Great Lakes Areas of Concern by the International Joint Commission. These areas have had Remedial Action Plans completed to address contamination concerns.

Priority Watersheds

The Wisconsin Nonpoint Source Water Pollution Abatement Program (NPS Program) was created in 1978 by the state legislature. This program selected priority watersheds based on numerous factors including, but not limited to: unique species, potential to respond positively to nonpoint source controls and sensitivity to phosphorus loading. The program has provided financial and technical assistance to landowners and local governments to reduce nonpoint source pollution. Eight watersheds within the study area have been designated as Priority Watersheds through this program.

- Branch River Priority Watershed is located eight miles southeast of the city of Green Bay and approximately 15 miles northeast of the city of Manitowoc and is located within the Manitowoc River Basin. Approximately 41,656 acres of the Branch River Watershed lies within the boundaries of Manitowoc County and 27,020 acres within Brown County.
- Kewaunee River Priority Watershed traverses central Kewaunee County and eastern Brown County. Of the watershed's 139 square miles, 82 percent lies in Kewaunee County.
- Manitowoc River Priority Watershed is part of the Lake Michigan basin. The main stem of the Manitowoc River, formed by the confluence of the North and South branches of the Manitowoc River, flows easterly approximately 36 miles through predominantly agricultural land before entering Lake Michigan. The Lower Manitowoc River watershed includes the 168 square mile area of land that extends from the confluence of the North and South branches of the Manitowoc River.
- North, East and West Branch Milwaukee River Priority Watershed is located in portions of Sheboygan, Ozaukee and Washington counties and has a drainage area of 150 square miles.
- Onion River Priority Watershed covers about 100 square miles and has 124.2 miles of streams. It flows southerly for about half its length before turning northward, entering the Sheboygan River in the city of Sheboygan Falls. Belgium Creek is the only major tributary to the Onion River. Land use in the watershed is primarily agricultural.
- Pigeon River Priority Watershed is 30 miles long and is a tributary of Lake Michigan that lies within the Sheboygan River Basin. It forms at the confluence of the Pigeon and Meeme River Branches near the Sheboygan-Manitowoc County line.
- Red River/Little Sturgeon Bay Priority Watershed is a 139 square-mile drainage area located in Door, Kewaunee and Brown Counties and includes the city of Sturgeon Bay. It covers the southern portion of the Door County peninsula. The watershed is a sub-basin of the Twin-Door-Kewaunee basin. The only incorporated area in the watershed is the city of Sturgeon Bay, where the majority of the watershed's population lives. Karst features such as sinkholes, caves, swallets, exposed bedrock and fracture traces are prevalent in many areas of the watershed.

- Sheboygan River Priority Watershed originates in east-central Wisconsin and drains an area of land situated between Lake Winnebago and Lake Michigan. The watershed is a sub-basin of the larger Sheboygan River drainage basin that includes: the Sheboygan River, the Pigeon River, Mullet River, Onion River, Black River, and direct tributaries to Lake Michigan. The Sheboygan River Watershed drains approximately 245 square miles in portions of four counties: Sheboygan, Fond du Lac, Calumet, and Manitowoc.

Non-Priority Watersheds

In addition to the eight priority watersheds within the study area, there are four non-priority major watersheds in the area.

- Ahnapee River Watershed covers northern Kewaunee County and southern Door County. It flows through predominantly agricultural lands and wetlands in its 117-square mile watershed.
- Black River Watershed is located entirely within Sheboygan County and contains the 11.4 mile Black River. It is characterized primarily as natural lowlands with adjacent agricultural areas.
- Mullet River Watershed is about 98 square miles and it originates at the outlet of Mullet Lake in Fond du Lac County, running northeast into Sheboygan County. The river then runs east and drains into the Sheboygan River near Sheboygan Falls.
- Twin River Watershed - The West Twin River watershed is in north central Manitowoc County and southeastern Brown County with a small portion extending into southwestern Kewaunee County. The East Twin River watershed is in northeastern Manitowoc County and southeastern Kewaunee County. It is 34.5 miles long with a watershed of 133 square miles. The primary land use is agriculture, but some industries border the river in the city of Two Rivers.

Groundwater

The study area's groundwater reserves are being held in two principal aquifers: the eastern dolomite aquifer, and the sandstone and dolomite aquifer.

The Eastern Dolomite Aquifer occurs from Door County to the Wisconsin Illinois border. It consists of Niagara dolomite underlain by Maquoketa shale. In areas where fractured dolomite bedrock occurs at or near the land surface, the groundwater in shallow portions of the western dolomite aquifer can easily become contaminated. In Kewaunee and Manitowoc Counties, there is little soil to filter pollutants carried or leached by precipitation. This means little or no filtration takes place once the water reaches large fractures in the dolomite. This has resulted in many groundwater quality problems.

The Sandstone and Dolomite Aquifer consists of layers of sandstone and dolomite bedrock that vary greatly in their water-yielding properties. In eastern Wisconsin, this aquifer lies below the eastern dolomite aquifer and the Maquoketa shale layer. These rock types dip slightly to the east, south, and west, away from north central Wisconsin, becoming much thicker and extending to greater depths below the land surface in the southern part of the state. In eastern Wisconsin, most users of substantial quantities of groundwater tap this deep aquifer to obtain a sufficient amount of water.

Surface Waters

There are numerous lakes and rivers in the three counties of the study area. The most significant surface water feature is Lake Michigan

Lakes (Map 9)

- *Lake Michigan*: Lake Michigan borders on Kewaunee, Manitowoc and Sheboygan counties. Kewaunee County includes approximately 27 miles of shoreline. This area of Lake Michigan averages slightly more that 400 feet deep in waters within two miles of shore. Depth along the southern border reaches a maximum of 923 feet and depth along the northern border reaches approximately 820 feet. Access is possible from park lands and launching sites in the cities of Algoma and Kewaunee, Manitowoc, Two Rivers, Cleveland, and Sheboygan.

Kewaunee County Lakes

- *West Alaska Lake* in Kewaunee County has approximately 23 surface acres and a maximum depth of 38 feet. It is a small brown water seepage of moderate alkalinity. The fishery of the lake consists of largemouth bass, panfish, rainbow trout as well as muskellunge. A county access site is provided and contains a boat launch.
- *East Alaska Lake* in Kewaunee County has approximately 50 surface acres and a maximum depth of 45 feet. It is a small, clear, hard water seepage lake with intermittent inlet from West Alaska Lake and seasonal outlet to Lake Michigan. The fishery of the lake consists of muskellunge, walleye, largemouth bass, panfish, crappies, and yellow bullheads. Not native to the lake. Muskellunge has been stocked experimentally. The lake has been known to receive a spill from a nearby cheese factory. Public access is provided by a county road.

Other Kewaunee County lakes in the southwestern part of the county outside the study area include:

- *Shea's Lake*
- *Engledinger Lake*
- *Heidmann Lake*

Manitowoc County Lakes

- *Harpt Lake* is located in the town of Gibson in north central Manitowoc County. The lake is a popular fishing area for large walleye, largemouth bass, and black crappie. Only one horsepower electric motors are allowed on the lake.
- *Silver Lake* lies within a 12 acre park located along U.S. Highway 151, west of the city of Manitowoc in the town of Manitowoc Rapids. It is leased to the county by the Franciscan Sisters of Christian Charity of the Holy Family Convent. No motorboats, campfires, camping, or swimming are allowed on the lake.
- *Pigeon Lake* in Manitowoc County has approximately 77 surface acres and a maximum depth of 67 feet. It is a seepage lake in a terminal moraine. This lake has hard, clear water and is one of the most heavily used lakes in the county. The lake is managed for largemouth bass, panfish, northern pike and brown trout. Public access and parking is available by a study area road and contains a boat launch.
- *English Lake* is located along Brunner Road, west of STH 42, in the town of Newton. The lake is a popular location for catching walleye, largemouth bass, and panfish. It has restrictions on the use of motorboats and water-skiing.
- *Hartlaub Lake* is located southwest of the city of Manitowoc in the town of Newton. The lake is used for fishing northern pike, bass, walleye, and panfish. Electric motors are the only type of power motor allowed on the lake.
- *Carstens Lake* is located along Carstens Lake Road, east of STH 42, in the town of Newton. The access to the lake is limited to boats with electric motors only. The lake has a large stock of northern pike and bass.
- *Wilke Lake* is located in the southwestern portion of the county in the town of Schleswig. It is a popular place for catching largemouth bass, northern pike, and walleye. Restrictions on

motorboats and water-skiing are in place on the lake. The access has a small area designated for picnicking.

- *Cedar Lake* is located in the town of Schleswig in the southern portion of the county. It is Manitowoc County's largest inland lake, which is inhibited by several fish species.
- *Horseshoe Lake* is located in the town of Meeme, in the south central portion of the county west of State Trunk Highway (STH) 42. Swimming and boats with motors are prohibited on the lake.
- *Gass Lake* is located southwest of the city of Manitowoc in the town of Newton. The spring fed lake has no development along its shoreline. It is a popular lake for catching large mouth bass. Electric motors are the only type of power motor allowed on the lake.
- *Tuma Lake* is located in the town of Gibson in the north central portion of the county. The lake provides good fishing for walleye, bass, bluegills, perch, black crappies, and northern pike. One horsepower electric motors are the only type of power motor allowed on the lake.
- *Shoe Lake* is located in the town of Schleswig in the southwestern portion of the county. The lake is surrounded by forest growth, and very little shoreline development. Motor powered boats are prohibited on the lake, as well as camping and campfires at the access area.
- *Spring Lake* is located in the town of Meeme in south central Manitowoc County. The lake is known for its northern pike and largemouth bass. No motor boats are allowed on the lake.

Other Manitowoc County lakes in the western part of the county outside the study area include:

- *Long Lake*
- *Bullhead Lake*

Sheboygan County Lakes

- *Sheboygan Lake* is a drainage lake located within the Broughton Sheboygan County Marsh. It covers more than 674 acres within the 14,000 acre marsh, but averages no more than 3 feet deep.
- *(Big) Elkhart Lake* in Sheboygan County has approximately 300 surface acres and a maximum depth of 119 feet. It is the largest kettle moraine in the county and the fourth deepest lake in the state. Increase in fertility is gradual and due mainly to septic tank seepage and some isolated surface water runoff from cropland and farm operations. The fishery of the lake includes walleye, panfish and smallmouth bass. Public access is provided.
- *Crystal Lake* is located in the town of Rhine near the village of Elkhart Lake. The lake is 113 acres and is heavily used for fishing and boating.
- *Little Elkhart Lake* is adjacent to Big Elkhart Lake and is known for fishing. The size of motors allowed on the lake is limited. The lake covers 47 acres and has a maximum depth of 21 feet.
- *Gerber Lake* consists of two contiguous basins covering approximately 22 acres in the town of Rhine. The basins are spring-fed and are known for largemouth bass and bluegill fishing. No motor boats are allowed on the lake.

- *Jetzers Lake* is a small lake located in the town of Herman covering around 14 acres. The lake is spring-fed and has an outlet to the Pigeon River.

Other Sheboygan County lakes in the southern part of the county lying outside the study area include:

- *Plymouth Mill Pond*
- *Lake Ellen*
- *Waldo Mill Pond*
- *Crooked Lake*
- *Lake Seven*
- *Random Lake*

Rivers, Streams and Creeks (Map 10)

Outstanding Water Resource Waters in the study area that have been designated by the state of Wisconsin under Wisconsin Administrative Code NR 102. NR 102 establishes water quality standards for different classes of surface waters in the state. Only Nichols Creek in Sheboygan County and Scarboro Creek in Kewaunee County are considered Outstanding Resource Waters, while portions of Casco Creek, the Branch River and Ben Nutt Creek are considered Exceptional Resource Waters.

The study area contains a number of major river systems that flow from west to east across the study area. Major rivers in the study area include:

- The *Ahnapee River* flows through predominantly agricultural lands and wetlands in northern Kewaunee and southern Door Counties.

- *Kewaunee River* in Kewaunee County has approximately 106 surface acres and traverses 21.9 miles. It is a large, low gradient river that drains almost completely across the base of the Door Peninsula. The stream is fertile and generally turbid. The fishery of the river consists of trout from the mouth of Casco Creek. The rest of the stream supports forage fishes. Access is possible from numerous road crossings. A state public hunting ground borders the stream on one bank for 2.38 miles near Bruemmer County Park.

- The main stem of the *Manitowoc River*, formed by the confluence of the North and South branches of the Manitowoc River, flows easterly approximately 36 miles before entering Lake Michigan.

- The *Mullet River* originates at the outlet of Mullet Lake in Fond du Lac County and runs generally east before joining the Sheboygan River in the City of Sheboygan Falls. The two named tributaries to the Mullet River are La Budde Creek and Jackson Creek. The watershed contains nearly 2 miles of Class I trout water, 10 miles of Class II trout water and nearly 35 miles of streams supporting a warm water sport fish community.

- The *Sheboygan River* originates in east-central Fond du Lac County and flows generally southeastward into the City of Sheboygan where it enters Lake Michigan. The major tributaries to the Sheboygan River are the Onion and Mullet Rivers. Other named warm water tributaries to the Sheboygan River are Otter and Weedens Creeks. Millhome, Schuett and Feldner's Creeks are trout streams located in the Sheboygan River Basin. There are also

nine dams in the Watershed: Sheboygan Marsh, Kiel, Rockville, Millhome, Johnsonville, Sheboygan Falls, Waelderhaus, Riverbend and Mischo's. The Franklin dam was removed in 2001, restoring this river reach to a free-flowing condition. The positive change in flow, temperature, and oxygen levels will result in habitat suitable for game fish species such as smallmouth bass, northern pike, and rock bass.

- The *Onion River* flows southerly for about half its length before turning northward, entering the Sheboygan River in Rochester Park in the City of Sheboygan Falls. Belgium Creek is the only major tributary to the Onion River. There are two dams on the Onion River, which form the Waldo and Hingham impoundments.
- *West Twin River* in Manitowoc County has approximately 119.8 surface acres and traverses 18.3 miles. This river drains the greater portion of the northwestern part of the county before entering Lake Michigan at Two Rivers. The fishery of the river consists of northern pike, channel catfish, smallmouth bass, rock bass, carp and bullheads. Rainbow trout utilize the stream during spring spawning migrations from Lake Michigan. Access is available from 687 acres of state-leased lands west of Two Rivers as well as at 8 additional road crossings.

Wetlands

According to the Wisconsin Department of Natural Resources, wetlands are areas where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophilic vegetation. Other common names for wetlands are swamps, bogs, or marshes. Wetlands serve as a valuable natural resource. They provide scenic open spaces in both urban and rural areas.

Wetlands also act as natural pollution filters, makings many lakes and streams cleaner and drinking water safer. They act as groundwater discharge areas and retain floodwaters. Filling or draining of wetlands is costly, destroys the productive capacity of the ecosystem and can adversely affect surface water quality and drainage. Finally they provide valuable and irreplaceable habitat for many plants and animals.

Within the study area, there are thousands of acres of wetlands. Many of these wetlands are large complexes associated with lowland areas in western Sheboygan and Manitowoc counties and the northern areas of Kewaunee County. Major wetland complexes include the Sheboygan Marsh, Duvall Swamp and Collins Marsh as well as others (Map 11).

The Kewaunee County portion of the study area falls within the boundaries of the Special Wetlands Inventory Study (SWIS), a joint federal and state effort to study wetlands of the Green Bay area. More than 4,000 of the 6,000 wetlands mapped by the WDNR were field verified and a database created which classifies and characterizes each wetland.

FORESTS AND WOODLANDS

Woodlands throughout the study area are comprised primarily of sugar maple, yellow birch, American beach, basswood, red oak and red pine, hemlock, sugar maple, paper birch, aspen and white cedar, and small stands of the northern hardwood species. Also seen in the study area are balsam firs, white spruce, black spruce and tamarack. These woodlands provide an aesthetic and natural purpose, providing habitat to many animals. Two state forests are located in the study area (Map 12).

Point Beach State Forest

Point Beach State Forest is located along Lake Michigan just north of the city of Two Rivers in Manitowoc County. The point juts seven miles into Lake Michigan, and the six-mile beach occasionally yields pieces of 19th century ships that sank there. There is also an interpretive center and indoor group camps.

Kettle Moraine State Forest – Northern Unit

The northern unit of the Kettle Moraine State Forest contains approximately 30,000 acres of forest lands. Outdoor recreation is the primary use and management of this forest. Special interest areas include Dundee Mountain, the Henry S. Ruess Ice Age Visitor Center, Parnell Tower and Esker just to name a few. Spruce Lake Bog and Jersey Flats Prairie are also areas that are excellent for viewing wildlife. Wildlife species found throughout the forest include whitetail deer, turkeys, Cooper's hawks, red squirrels, meadowlarks, bluebirds and red-winged blackbirds.

MAJOR PARKS, RECERATION AREAS AND OPEN SPACES

The Lake Michigan Ice Age Trail study area boasts some of the most popular parks in the state as well as some of the most picturesque areas. The study area boasts a number of state and local trail facilities including the Ahnapee Trail and the Old Plank Road Trail. A portion of the Ice Age National Scenic Trail heads north from the city of Kewaunee. The following inventory provides a description of the state parks and the major county parks throughout the study area (Map 13).

State Parks

Fischer Creek State Recreation Area

This 123-acre passive recreation area has nearly a mile of Lake Michigan shoreline, scenic wooded bluffs, grasslands and wetlands. It is managed by Manitowoc County.

Kohler-Andrae State Park

Kohler-Andrae State Park is one of the last natural preserves along the Lake Michigan shore, and is open for everyone to explore and enjoy. as campgrounds, picnic areas, a bath house, nature center, trails and roads. This 1,000-acre scenic spot on the shore of Lake Michigan offers a peaceful setting year round. There are campsites, approximately two miles of beach, a nature center and two nature trails.

Wade House State Historic Site

The Wade House State Historic Site, situated in Greenbush at the entrance of the Kettle Moraine State Forest, once served as an inn and stopping point for stage coaches traveling on the Fond du Lac-Sheboygan Plank Road. Guides in Civil War era costumes, and period furniture and furnishings give guests a firsthand glimpse of a time gone by. The Wesley Jung Carriage Museum, located on the grounds, holds one of the world's outstanding authentic collections of hand- and horse-drawn vehicles.

Recreation Trails

Ice Age National Scenic Trail

One of only eight national scenic trails in the United States, the Ice Age Trail will eventually be a thousand-mile walking/hiking trail located in and unique to Wisconsin. About 600 miles of the Trail are now available for use. The route of the Trail approximates the last stopping point or terminal edge of the most recent continental glaciation. The Trail varies to include other features of the glacial landscape, portions of the "Driftless Area", and communities. Congress recognized the national significance of the Trail by designating it a National Scenic Trail (NST) in 1980. The State of Wisconsin designated the Trail a State Scenic Trail in 1987.

Ahnapee State Trail

The Ahnapee State Trail is a multi-use trail. The Ahnapee State Trail spans about 30 miles between Casco, Algoma and Sturgeon Bay. The 8 to 10 foot wide trail has a firm surface for hiking, trail bikes and horseback riding. During the winter the trail is used especially by snowmobilers - though cross-country skiing is also permitted - and interconnects with 95 miles of snowmobile trails in Kewaunee County.

Mariners Trail

The Mariners Trail is a joint project of the cities of Manitowoc and Two Rivers. The 12-mile paved trail hugs the shoreline of Lake Michigan between Manitowoc and Two Rivers and is considered to be the longest, continuous, scenic view of Lake Michigan in the state of Wisconsin. From the south, the trail begins in downtown Manitowoc at the 8th Street Bridge, near the Wisconsin Maritime Museum. The trail proceeds north past the Inn on Maritime Bay, the YMCA, the Manitowoc Breakwater Light, and the Manitowoc Marina to West of the Lake Gardens. From there, the trail winds north and east along the Lake Michigan shoreline towards Two Rivers. The trail eventually leads to downtown Two Rivers where a variety of restaurants and shopping can be found. The Rogers Street Fishing village and Neshotah Beach can be accessed from the Two Rivers end of the trail. The trail will provide access between Two Rivers and Point Beach State Forest in the near future.

Old Plank Road Recreation Trail

This popular, 17-mile, trail accommodates bicyclists, runners, walkers, in-line skaters, horseback riders, moped users, Nordic skiers, and snowmobilers on 10 feet of asphalt and 8 feet of turf. The trail parallels State Highway 23 from Sheboygan, past the village of Kohler, Sheboygan Falls, Plymouth, and onto historic Greenbush, linking with the Ice Age Trail in the northern unit of the Kettle Moraine State Forest.

Snowmobile Trails

Manitowoc County has 222 miles of State funded snowmobile trails. Nine area clubs maintain these trails throughout the county. Private land owners provide the majority of the land used for the public trail system.

Kewaunee County has 152 miles of State funded snowmobile trails including the Ahnapee Trail. Three snowmobile clubs provide trail maintenance.

County Parks

Kewaunee County

Bruemmer County Park

This 76 acre recreation site located about one mile west of the city of Kewaunee and is Kewaunee County's largest park. It primarily functions as a passive recreation area. It's most popular features include picnic areas, playground equipment, trails, and a small zoo.

Krohn's Lake

Krohn's Lake is located southwest of the city of Algoma just off of CTH K. This park contains a grill, boat ramp, restroom facilities, docks and plenty of off-street parking. Boat motors are not allowed on Krohn's Lake.

Winter Park Ski Area

The Winter Park Ski Hill area is located just west of the city of Kewaunee along the Kewaunee River. The park contains a tubing hill and mountain bike trails as well as a ski chalet. The C.D. Buzz Besadny Anadromous Fisheries Facility is located immediately adjacent to the north of the park on Ransom Moore Lane.

Kewaunee Nature Walk

This 1,500 ft. boardwalk path over the marshlands is located one-quarter mile north of the city of Kewaunee, the walkway meanders through the wetland habitat along the Kewaunee River, ending in an observation deck with a panoramic view of the river.

Manitowoc County

Manitowoc County has three large parks with developed facilities. In addition, there are 16 smaller parks and lake access sites throughout the county.

Cherney Maribel Caves Park

This park is located in the northern portion of the county along CTH R in the town of Cooperstown. This 75 acre park was the first major park developed by the county. It is famous for the rugged cliff line that contains several caves. The park is primarily used for sight-seeing, hiking, and picnicking.

Walla Hi Park

This 160 acre county park is located in southwestern Manitowoc County in the town of Schleswig, about four miles east of the city of Kiel. The park has varying environmental characteristics located within its boundaries. The scenic kettle moraine landscape of the park ranges from wooded areas to open grassy spaces. In addition, small springs and streams flow through the park. Popular activities at the park include fishing, hiking, cross-country skiing, and picnicking. An abandoned fish hatchery and pond fed by natural springs are two interesting attractions found within the site. Camping and campfires are prohibited in the park.

Lower Cato Falls Park

This county park is located in the town of Cato, about one mile east of the community of Clarks Mills, between CTH JJ and the Manitowoc River. This 84 acre park has two principal landscaped features: the developed upland area and lower natural wooded area along the Manitowoc River. The lower section of the park includes unique rock formations and a waterfall along the river. Two wooded stairways are provided for access from the upper portion of the park, down the steep escarpment, to the lower portion of the park. Popular activities at the park include: picnicking, hiking, and nature trail walks.

Sheboygan County

Broughton Sheboygan Marsh Park

This 30 acre developed year round park boasts the "Marsh Lodge" (full service restaurant and tavern), and "Broughton Lodge", a multi-purpose facility. The 64 fully developed campsites include showers, playground, picnic areas, canoe and boat rentals, launch ramp, and fishing piers. County snowmobile trails traverse the Marsh and connect with the Countywide 199 mile trail system. The Sheboygan Marsh Wildlife Area includes over 13,000 acres and attracts hunters, fishers, and wildlife/natural observers.

Gerber Lakes Public Fish & Wildlife Area

Sheboygan County's newest public lands, this Fish & Wildlife Area is open to the public for multiple outdoor recreation uses. No development is planned other than to provide for off-road parking. Habitat restoration is occurring. The property is open to hunting.

Recreational Marinas

A survey of all recreational marinas operating within the area was conducted in the fall of 2002 by the Bay-Lake Regional Planning Commission. There are 13 marinas in the three counties providing access to Lake Michigan. The results of the survey are found in Table 1.

Table 1: Recreational Marinas, Permanent and Transient Slips

Marina Name	Community	Permanent Slips	Transient Slips	Max Boat Size (ft)	Water Depth (ft)
Harbor Centre Marina	Sheboygan	250	yes/varies	50	10
Sheboygan Yacht Club	Sheboygan	60	yes/varies	60	10
Manitowoc Marina	Manitowoc	250	30	100	5 to 10
Seagull Marina and Campgrounds	Two Rivers	30	20	38	10
Stop and Dock Marina	Two Rivers	40	5	30	3 to 10
Twin Cities Marine Inc.	Two Rivers	25	5	26	12
Stans Marina	Two Rivers	20	6	28	6
Inner Harbor Marina	Kewaunee	130	20	100	15+
Kewaunee Marina	Kewaunee	75	25	60	5 to 6
Algoma Marina	Algoma	45	yes/varies	45	6
Captain K's Landing	Algoma	26	12	35	9
Pier 42 Marina on the Lake	Algoma	36	12	42	6
Algoma Boat Club	Algoma	24	yes/varies	26	4

Source: Bay-Lake Regional Planning Commission, Survey of Marinas, 2002

Other Local Cultural Resources

von Stiehl Winery in Algoma is housed in a 1850s era building that was originally the Ahnapee Brewery. Wisconsin's oldest winery features tours and tastings from their Bohemian tasting salon seven days a week May 1 to October 31 and tastings year round. The current product line includes about two dozen wines featuring apples, cherries, plum, raspberry, blueberry, as well as dessert wines and non-alcoholic offerings.

Crescent Beach and Boardwalk along Lake Michigan connects the Algoma Visitor Center to the Algoma Marina a half mile up the shoreline. The boardwalk is constructed from recycled plastic lumber and is handicapped accessible at both ends. In summer, sun bathing, swimming, building sandcastles and collecting rocks are common activities.

Once slated for the wrecking ball, **Netto Palazzo** in Algoma was brought back to life in 1994. The Italianate brick structure was built in 1890 as a hotel but never completed. It housed the Ahnapee Furniture Company for years and eventually became the home of the Algoma Net Company. In 1994, the Gleason Company - parent to Algoma Net - donated the building to Community Improvement of Algoma which in turn sold the building to local entrepreneurs. Currently, Netto Palazzo houses an antique mall in the lowest level, an art gallery, beauty & tanning salon, casual apparel store, deli and gourmet coffee and chocolate shop and Italian Motorcycle Museum on the ground floor.

Geppetto's Top of the Hill Shop at Svoboda Industries in Kewaunee may be best known for having the world's largest grandfather clock right outside their factory. Svoboda's Industries continues to sell clocks and clock kits from the Top of the Hill showroom attached to the factory building.

The **Kewaunee County All Terrain Vehicle Park** draws ATV enthusiasts from all over the state. Riders have the opportunity to wind through 18 miles of wooded and open countryside from dawn to dusk. The terrain varies from flat fields to bumps that encourage getting airborne. A high intensity riding area makes this facility one of Wisconsin's best. The park also includes a pavilion with beverages, picnic grounds, restrooms, and a wash area for ATVs. The park is open to the public with donations accepted.

Built in 1876, the **Kewaunee County Jail Museum** was then the sheriff's residence, office and the local jail. It now houses displays of local history. The museum includes the original 1876 cell blocks, some of the last of their kind in existence, that measure a mere 5 feet by 6 feet. A photo of Wisconsin's first female sheriff who served Kewaunee County and a scale model of the famous U.S.S. Pueblo--the ship built in Kewaunee in 1944 and captured by the North Koreans in 1968 are located in the museum. Life size carvings of Father Marquette who landed in Kewaunee in 1647 also grace the building.

Pinecrest Historical Village located in Manitowoc County is an authentic village of the 1900s, depicting life in Manitowoc County. It includes 16 historic buildings dating from 1846 to the 1920s. Music, arts, ethnic, and holiday festivals keep visitors coming back for the excitement of the past.

The **Old Rock Mill Museum** is located just east of Maribel in Manitowoc County along the Devils River. The mill was built in 1847 and is listed on the National Register of Historic Places for both its architectural and historical significance. As the oldest existing building in Manitowoc County, it remains the only mill with original flouring equipment in an area that once contained 38 water-powered mills.

The **Wisconsin Maritime Museum** in the city of Manitowoc offers an education in the history of Lake Michigan and the people living on its shores. Permanent exhibits include shipwrecks, lumbering, wooden and modern shipbuilding displays. The Museum offers tours of the U.S.S. Cobia, a WWII submarine permanently docked adjacent to the museum.

The **Rahr-West Art Museum**, located in an 1893 Victorian mansion in the city of Manitowoc, is an elegant setting for fine collections of 19th century American paintings and furniture. Chinese ivory carvings, Boehm porcelains, art glass, prehistoric relics and antique dolls. A new wing exhibits the permanent collection of 20th century American artists. There are also new exhibitions that change every four to six weeks.

The **Capitol Civic Centre** in the heart of downtown Manitowoc has been dramatically restored. The Capitol Theater opened its doors with a vaudeville performance on June 16, 1921. The transformation of the old Capitol Theater into the Capitol Civic Centre, home for the performing arts, was a community project supported by private donations and hundreds of volunteers. Today this 1,129 seat theater hosts many local theater and music groups, as well as touring Broadway plays, visiting symphonies and orchestras, and famous stars.

Hamilton Wood Type and Printing Museum in Two Rivers opened in May of 1999, and displays the largest collection of wood printers type in the world. Over a million blocks in six languages are displayed along with the woodworking equipment that brought them to life. In a factory setting, the process of making wood type has been rekindled by volunteers that make the type blocks with the same machinery that was used over 100 years ago. This fascinating industry

brought Two Rivers worldwide recognition in the 1880-90s as the J.E. Hamilton Type Factory became the largest producer of wood type for the printing industry.

The **Two Rivers History Museum** is located in the former home to the Sisters of St. Agnes. The museum contains changing art and cultural displays, local history and religious rooms throughout. Each room focuses on an element of Two Rivers' past including: music, sports, convent life, genealogy, city services, ethnic heritage, church artifacts, religious history, a typical one room school, a 1930s art deco room, a gift shop and agricultural displays in the garage. Open all year - free admission.

An 1850 immigrant hotel, **Historic Washington House** is home to an original saloon serving non-alcoholic drinks, a ballroom for music and theatrical performances, and rooms that bring back the good old times in Two Rivers. A replica of Ed Berners' Ice Cream Parlor serves ice cream sundaes, treats and old fashioned sodas the same as they were made in 1881. Ed Berners invented the ice cream sundae in Two Rivers that year. The Washington House also serves as both the Visitor Information Center and the offices of the Two Rivers Historical Society.

Rogers Street Fishing Village in Two Rivers is a French-Canadian fishing village listed in the National Register of Historic Places. A special exhibit traces the original French-Canadian fishermen who emigrated in their mackinaw boats from Quebec to settle Two Rivers. Two 1936 commercial fishing boats, four vintage fishing outbuildings, and the 1886 lighthouse that once stood at the harbor's entrance can be toured at the village. The Great Lakes Coast Guard Museum next door relives the stories of the U.S. Lifesaving Service in Two Rivers through the heroic men who risked their lives to rescue others.

SCIENTIFIC AND NATURAL AREAS

The Wisconsin State Natural Area program was established to formally designate sites in natural or near natural condition for scientific research, the teaching of conservation biology, and most of all, preservation of their natural values and genetic diversity for the future. These areas are not intended for intensive recreation use, but rather to serve the mission of the Natural Areas Program, to locate and preserve a system of State Natural Areas harboring all types of biotic communities, rare species, and other significant natural features native to Wisconsin. Map 14 identifies the location of these natural areas.

Alaska Lake in Kewaunee County is a thirty acre, deep, alkaline, seepage lake with no development on its shore. The lake is owned by the county and a small pier is provided for public access. The shore is ringed by second growth birches and white cedar with a grazing history.

Cherney-Maribel Caves in Manitowoc County is located on the West Twin River and contains a 50-foot limestone bluff, a rare occurrence within the glaciated study area of Wisconsin. The "caves" in the side of the bluff are really shallow indentations caused by gaps in the black dolomite. A young beech-maple woodland dominates the uplands and contains a showy spring flora. The shaded cliff contains polypody, bulbet, and walking ferns. An endangered plant species is also present. At the cliff base and throughout the floodplain are large white cedars. The river bottom forest has many birds usually found farther north. Among these are winter wren, solitary vireo, blackburnian warbler, and yellow-bellied flycatcher.

Kohler Park Dunes in Sheboygan County has three uncommon Great Lakes shore habitats present in this area: Lake Michigan dunes consisting of large, active portions surrounded by stabilizing dunes; one quarter mile of beach community; and two small remnants of white pine forest. The area is rich in coastal plant species and there are numerous critical plant species present. A 10 acre buffer zone as been established on the west edge of the scientific area.

Point Beach Ridges features a topography of 11 alternating ridges and swales paralleling the present Lake Michigan shoreline. Formed through the protracted lowering of glacial Lake Nippissing, the ridges and swales are actually old beaches deposited during the last 8,000 years. Except for a strip of dunes and beach along the lake, the area is forested with a variety of conifers and hardwoods. A range of successional stages is exhibited, varying from shifting sand to open swales and wooded ridges. The 11th swale from Lake Michigan is lightly forested with black ash and tamarack, and the 9th ridge has white pine, hemlock, white cedar, and yellow birch. Ridges 8 to 5 have more red maple and white birch. The transition to a sandier, drier, and sunnier environment continues to the east. Ridge 2 is stabilized by junipers, bearberry, and a host of sand plants. Ridge 1 and the sand beach east of it are vegetated with the unique and specialized flora of coastal beaches, of which undisturbed examples are rare. Several uncommon plants inhabit the dunes, including dune thistle (*Cirsium pitcheri*), clustered broom-rape (*Orobanche fasciculata*), thick-spike wheatgrass (*Elymus lanceolatus ssp. psammophilus*), prairie sand-reed (*Calamovilfa longifolia var. magna*), and dune goldenrod (*Solidago simplex var. gillmanii*), all state-threatened. The endangered sand dune willow (*Salix cordata*) is also found here at its only known Wisconsin location. Point Beach Ridges is owned by the DNR and was designated a State Natural Area in 1971.

Sheboygan County Memorial Arboretum in Sheboygan County is a wet lacustrine swamp that is made up primarily of black ash and American elm with alder in the understory. The tree canopy is somewhat open and there many plant species throughout the swamp and there is little local relief. Trails run along the east and west fringes of the swamp.

Two Creeks Buried Forest in Manitowoc County is a unit of the Ice Age Scientific Reserve. It is an area of natural interest to Pleistocene geologists around the world. A soil and glacial till profile exposed by Lake Michigan illustrates a sequence of events from prior to the last glacial advance. The remains of spruce forest are blanketed with lacustrine deposits from a glacial lake, which are in turn covered by layers of glacial till from over 11,000 years ago. According to Manitowoc County Outdoors (1967), similar forest remains are found when digging wells throughout much of the Fox River Valley. Two Creeks Buried Forest is owned by the DNR and was designated a State Natural Area in 1967.

VanderBloemen Bog lies within the end moraine of the Valders stage of Wisconsin glaciation and contains an undisturbed open bog with successional patterns to hardwood swamp. The site features a quaking bog without open water. Typical bog species include pitcher plant, sundews, moccasin flower, and cranberries. Surrounding the open bog is a fringe of tamarack, black spruce, and white pine. The outer edge of the area is wooded with white birch, red maple, and black ash. Several small areas with different dominants give the site a heterogeneous aspect. Nesting birds include wood thrush, veery, crested flycatcher, ovenbird, northern oriole, and goldfinch. VanderBloemen Bog is owned by Silver Lake College and was designated a State Natural Area in 1966.

Wilderness Ridge is located within Point Beach State Forest in Manitowoc County and is a T-shaped area that features a cross section of Glacial Lake Nippissing-aged beach ridges. The north-south sand ridges formed under water during the later post-glacial stages of Lake Nippissing. A fairly rapid fall in lake level permitted the ridges to exist without going through the leveling erosional processes. Similar ridges are still being formed offshore in Lake Michigan's breaker zone. The 66-foot wide north-south transect follows a ridge wooded with red and white pines, hemlock, sugar maple, red maple, and yellow birch. Common groundlayer species along the ridge include yellow bluebead-lily, wintergreen, American starflower, Canada mayflower, three-leaved goldthread, and trailing arbutus. The east-west transect is 66 feet wide and crosses the ridge-swale topography. Four of the swales contain sedge meadows, filled with more than 28 species of sedges and many species of grasses. Surrounding the swales is a narrow, nearly impenetrable zone of shrubs. Wilderness Ridge is owned by the DNR and was designated a State Natural Area in 1953.

Woodland Dunes features a low area of ridge and swale topography near Lake Michigan, similar to that at Point Beach State Forest a few miles to the north. The series of narrow, parallel sand ridges represent former beach lines of Lake Michigan as water levels fell during post-glacial times. The ridges are separated by perennially wet swales. About two-thirds of the ridges are timbered with aspen, white birch, and red maple; the remaining third support a mature forest of yellow birch, beech, hemlock, and white pine. The understory contains elements typical of northern mesic forest, including shining club-moss, spinulose wood fern, American starfower, naked miterwort, and yellow-blue-bead-lily. Ash, elm, and alder dominate the swales with occasional patches of dogwood, willow, and sedges. White cedar, with occasional tamarack, is also found in the swales and on the ridge edges. Sweet colt's-foot (*Petasites sagittatus*), a threatened plant species, is found here in small numbers. Woodland Dunes, with its variety of habitats and proximity to Lake Michigan, is used by a great diversity of birds. Shorebirds utilize a nearby river marsh and often forage in adjacent farm fields. Songbirds, especially warblers and thrushes, make use of the forested portions of the dunes during migration. Southern bird species such as hooded warbler, blue-gray gnatcatcher, and white-eyed vireo are at the northern edge of their range here. The natural area is an excellent place to view all of Wisconsin's raptors during their fall migration down the lakeshore. Woodland Dunes is owned and managed by Woodland Dunes Nature Center and was designated a State Natural Area in 1992.

ENDANGERED RESOURCES

Both federal and state threatened and endangered resources were inventoried as part of a WDNR review of the Ice Age Trail project area in Sheboygan, Manitowoc, and Kewaunee Counties (Table 2) showed many occurrences of rare species and natural communities recorded in the WI Natural Heritage Inventory (NHI). Each species and natural community identified will be managed for long-term protection and enhancement by direction of the IAT master plan, local property manager, and Department Endangered Resources staff.

Table 2: Project Area Townships

Sheboygan County		Manitowoc County		Kewaunee County	
Township/Range	Town	Township/Range	Town	Township/Range	Town
T15NR20E	Greenbush	T17NR21E	Schleswig	T22NR24E	Carlton
T15NR21E	Plymouth	T17NR22E	Meeme	T22NR25E	Carlton
T15NR22E	Sheboygan Falls	T18NR21E	Centerville	T23NR24E	West Kewaunee
T16NR20E	Russell	T18NR22E	Eaton	T23NR25E	West Kewaunee
T16NR21E	Rhine	T18NR23E	Liberty	T24NR23E	Luxemburg
T16NR22E	Herman	T18NR24E	Newton	T24NR24E	Casco
		T19NR21E	Rockland	T24NR25E	Pierce
		T19NR22E	Cato	T25NR24E	Lincoln
		T19NR23E	Manitowoc Rapids	T25NR25E	Ahnapee
		T19NR24E	Manitowoc	T25NR26E	Ahnapee
		T19NR25E	Manitowoc		
		T20NR22E	Franklin		
		T20NR23E	Kossuth		
		T20NR24E	Two Rivers		
		T20NR25E	Two Rivers		
		T21NR22E	Cooperstown		
		T21NR23E	Gibson		
		T21NR24E	Mishicot		
		T21NR25E	Two Creeks		

Source: BLRPC, 2003.

Rare species and natural communities are identified in Tables 3 to 5 and are listed according to the respective county in which they were observed.

Table 3: Kewaunee County

Scientific Name	Common Name
Fundulus diaphanus	Banded Killifish
Emergent marsh	Emergent Marsh
Coregonus reighardi	Shortnose Cisco
Nycticorax nycticorax	Black-crowned Night-heron
Clinostomus elongatus	Redside Dace
Notropis anogenus	Pugnose Shiner
Lepomis megalotis	Longear Sunfish
Cakile edentula	American Sea-Rocket
Calamagrostis stricta	Slim-stem Small-reedgrass
Hendersonia occulta	Cherrystone Drop
Paravitrea multidentata	Dentate Supercoil
Northern Mesic Forest	Northern Mesic Forest
Nycticorax nycticorax	Black-crowned Night-heron
Sterna caspia	Caspian Tern
Calamovilfa longifolia var magna	Sand Reed-grass
Viola rostrata	Long-spur Violet
Circus cyaneus	Northern Harrier
Polystichum acrostichoides	Christmas Fern
Ammodramus savannarum	Grasshopper Sparrow

Strobilops affinis	Eightfold Pinecone
Euphyes bimacula	Two-spotted Skipper
Alder thicket	Alder Thicket
Melanerpes erythrocephalus	Red-headed Woodpecker
Sturnella neglecta	Western Meadowlark
Cypripedium parviflorum	Small Yellow Lady's-slipper
Equisetum variegatum	Variegated Horsetail
Bartramia longicauda	Upland sandpiper
Spiza americana	Dickcissel
Cardamine pratensis	Cuckooflower
Euphorbia polygonifolia	Seaside Spurge
Hendersonia occulta	Cherrystone Drop
Vitrina angelicae	Transparent Vitrine Snail

Source: WDNR, BER, 2003.

Table 4: Manitowoc County

Scientific Name	Common Name
Clinostomus elongatus	Redside Dace
Moxostoma valenciennesi	Greater Redhorse
Quadrula metanevra	Monkeyface
Fundulus diaphanus	Banded Killifish
Nycticorax nycticorax	Black-crowned Night-heron
Arethusa bulbosa	Swamp-pink
Moxostoma valenciennesi	Greater Redhorse
Alasmidonta marginata	Elktoe
Circus cyaneus	Northern Harrier
Erimyzon sucetta	Lake Chubsucker
Triglochin palustris	Slender Bog Arrow-grass
Ardea herodias	Great Blue Heron
Venustaconcha ellipsiformis	Ellipse
Alasmidonta viridis	Slippershell Mussel
Crangonyz gracilis	A side-swimmer
Wilsonia citrina	Hooded Warbler
Triglochin maritima	Common Bog Arrow-grass
Triglochin palustris	Slender Bog Arrow-grass
Hemidactylium scutatum	Four-toed Salamander
Emydoidea blandingii	Blanding's Turtle
Carex sychnocephala	Many-headed Sedge
Calamagrostis stricta	Slim-stem Small-reedgrass
Acris crepitans blanchardi	Blanchard's Cricket
Lythrurus umbratilis	Redfin Shiner
Carex lenticularis	Shore Sedge
Equisetum variegatum	Variegated Horsetail
Coregonus artedi	Lake Herring
Coregonus hoyi	Bloater
Coregonus Kiyi	Kiyi
Coregonus zenithicus	Shortjaw cisco
Malaxis brachypoda	White Adder's-mouth
Lythrurus umbratilis	Redfin Shiner
Medeola virginiana	Indian Cucumber-root
Dendroica cerulea	Cerulean Warbler
Lithospermum latifolium	American Gromwell
Sorex hoyi	Pigmy Shrew
Empidonax virescens	Acadian Flycatcher

Crangonyx richmondensis	A Side-swimmer
Striatura ferrea	Black Striate
Vitrina angelicae	Transparent Vitrine Snail
Ammodramus savannarum	Grasshopper Sparrow
Ammodramus henslowii	Henslow's Sparrow
Sturnella neglecta	Western Meadowlark
Euphorbia polygonifolia	Seaside Spurge
Cakile edentula	American Sea-rocket
Calamovilfa longifolia var magna	Sand Reed-grass
Pandion haliaetus	Osprey
Buteo lineatus	Red-shouldered Hawk
Hendersonia occulta	Cherrystone Drop
Triglochin palustris	Slender Bog Arrow-grass
Cypripedium parviflorum	Small Yellow lady's-slipper
Ardea herodias	Great Blue Heron
Artemisia dracunculus	Dragon Wormwood
Ranunculus cymbalaria	Seaside Crowfoot
Tofieldia glutinosa	Sticky False-asphodel
Diadophis punctatus edwardsii	Northern Ringneck Snake
Bartramia longicauda	Upland Sandpipper
Spiza Americana	Dickcissel
Tyto alba	Barn Owl
Acris crepitans blanchardi	Blanchard's Cricket Frog
Cardamine pratensis	Cuckooflower
Grammia phyllira	Phyllira Tiger Moth
Primula mistassinica	Bird's-eye Primrose
Forested Ridge and Swale	Forested Ridge and Swale
Elymus lanceolatus ssp psammophilus	Thickspike
Cirsium pitcheri	Dune Thistle
Salix cordata	Sand Dune Willow
Phalaropus tricolor	Wilson's Phalarope
Dendroica caerulescens	Black-throated Blue Warbler
Orobanche fasciculata	Clustered Broomrape
Empidonax flaviventris	Yellow-bellied Flycatcher
Carex sychnocephala	Many-headed Sedge
Charadrius melodus	Piping Plover
Viola rostrata	Long-spur Violet
Diplazium pycnocarpon	Glade Fern
Trillium nivale	Snow Trillium
Vertigo hubrichti	Midwest Pleistocene Vertigo
Bat Hibernaculum	Bat Hibernaculum
Adlumia fungosa	Climbing Fumitory
Arethusa bulbosa	Swamp-pink
Jeffersonia diphylla	Twinleaf
Lake – soft bog	Lake – soft bog
Vitrina angelicae	Transparent Vitrine Snail
Melanerpes erythrocephalus	Red-headed Woodpecker

Source: WDNR, BER, 2003.

Table 5: Sheboygan County

Scientific Name	Common Name
Alasmidonta viridis	Sippershell Mussel
Anemone multifida var hudsoniana	Early Anemone
Arethusa bulbosa	Swamp-pink
Artemisia dracunculus	Dragon Wormwood
Aster furcatus	Forked Aster
Bog Relict	Bog Relict
Buteo lineatus	Red-shouldered Hawk
Calylophus serrulatus	Yellow Evening Primrose
Cardamine pratensis	Cuckooflower
Carex richardsonii	Richardson Sedge
Carex sychnocephala	Many-headed Sedge
Coregonus artedi	Lake Herring
Crangonyx gracilis	A Side-swimmer
Crangonyx richmondensis	A Side-swimmer
Cypripedium arietinum	Ram's-head Lady's-slipper
Cypripedium parviflorum	Small Yellow Lady's-slipper
Cypripedium reginae	Showy Lady's-slipper
Elymus lanceolatus ssp psammophilus	Thickspike
Emydoidea blandingii	Blanding's Turtle
Etheostoma microperca	Least Darter
Gentiana alba	Yellow Gentian
Lithospermum latifolium	American Gromwell
Luxilus chrysocephalus	Striped Shiner
Malaxis brachypoda	White Adder's-mouth
Orconectes propinquus	Northern Clearwater Crayfish
Platanthera Dilatata	Leafy White Orchis
Platanthera hookeri	Hooker Orchis
Platanthera orbiculata	Large Roundleaf Orchid
Regina septemvittata	Queen Snake
Shrub-Carr	Shrub-Carr
Thalictrum revolutum	Waxleaf Meadowtrue
Thamnophis sauritus	Northern Ribbon Snake
Triglochin maritima	Common Bog Arrow-grass
Triglochin palustris	Slender Bog Arrow-grass
Trillium nivale	Snow Trillium
Trisetum melicoides	Purple False Oats
Valeriana sitchensis ssp uliginosa	Marsh Valerian
Venustaconcha ellipsiformis	Ellipse
Viola rostrata	Long-spur Violet

Source: WDNR, BER, 2003.

ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL AREAS

Environmental corridors have been identified for all of the study area by the Bay-Lake Regional Planning Commission (Map 15). These corridors serve to protect local water quality and wildlife habitat through identification and preservation of environmentally sensitive areas. They can be used as a means of controlling, moderating, and storing floodwaters while providing nutrient and sediment filtration. Environmental corridors can provide fish and wildlife habitat, recreational opportunities, and serve as buffers between land uses while improving the aesthetics of the community. The Commission has defined its environmental corridors to include the following set of uniformly available information: Wisconsin Department of Natural Resources wetlands; Federal

Emergency Management Agency's 100-year floodplains; areas with slopes greater than or equal to 12 percent; lakes, rivers, streams and ponds; a 75-foot lake and river setback; and, a 25-foot buffer of wetlands. Other features that are considered as part of the environmental corridor definition on an area by area basis include: designated scientific and natural areas; unique and isolated woodland areas; scenic viewsheds; historic and archaeological sites; unique geology; wetland mitigation sites; isolated wooded areas; unique wildlife habitats; parks and recreation areas; and other locally identified features.

OTHER LOCAL KEY NATURAL FEATURES

Locally important features where identified through a series of meetings with local officials, volunteers and other agency staff in each of the three counties in the study area. These features were highlighted due to their significance to the glacial geology of the study area.

Sheboygan County

La Budde Creek area

Manitowoc County

Eskers, Erratics, Maribel Caves

Kewaunee County

"Little" kettle moraine area

HISTORIC/CULTURAL AND ARCHEOLOGICAL RESOURCES

Historical Sites

Portions of the study area have been settled since the 1700s. Subsequently there are many buildings of historical importance within the study area. For the purpose of this plan, only historic districts on the state and/or national registry have been listed (Map 16). The State of Wisconsin requires any findings of human bones to be reported (*Wisconsin Statute*s s. 157.70) so the State Historical Society can do an investigation. Also, land developers trying to obtain state permits from the Wisconsin Department of Natural Resources or any development involving federal monies, are required to be in compliance with Section 106 of the National Historic Preservation Act and 36 CFR Part 800: Protection of Historic Properties.

Kewaunee County

Marquette Historic District was listed in the State and National Register on 11/4/93. It is situated on 200 acres and consists of over 40 buildings in Italianate, Queen Anne, and Colonial Revivals from the period between 1870 and 1938.

St. Lawrence Catholic Church was listed in the National Register on 2/21/89. It is situated on 40 acres and consists of two buildings in Pueblo and other styles from the period between 1892 and 1930.

Manitowoc County

Central Park Historic District was listed in the State and National Register on 12/1/00. It is situated on 100 acres and consists of 20 buildings and one object in Italianate, late 19th and 20th century Revivals and Art Deco from the period between 1850 and 1948.

Eighth Street Historic District was listed in the State and National Register on 3/17/88. It is situated on323 acres and consists of over 70 buildings in late Victorian, Classical Revival and Beaux Arts from the period between 1857 and 1937.

Frenchside Fishing Village was listed in the State and National Register on 1/6/87. It is situated on 94 acres and consists of over 30 domestic and agricultural buildings from the period between 1855 and 1920.

Sheboygan County

Cole Historic District was listed in the State and National Register on 12/1/88. It is situated on 10 acres and consists of 5 commercial and domestic dwellings in Greek Revival and other styles from the period between 1837 and 1867.

Downtown Historic District was listed in the State and National Register on 12/27/84. It is situated on 65 acres consists of over 30 buildings in late Victorian, 19th and 20th Century Revivals and other styles from the period between 1835 and 1928.

Mission House Historic District was listed in the State and National Register on 12/20/84. It is situated on 100 acres and consists of 5 buildings in Colonial Revival, Classical Revival and late Gothic Revival from the period between 1879 and 1934.

LAND USE AND LAND COVER

The land use of the study area is a mix between urbanized areas and agricultural uses. A majority of the three counties is agricultural with urban areas found around the major cities in each county (Map 17). Sheboygan County is the most developed with large urban areas surrounding the cities of Sheboygan, Sheboygan Falls and Plymouth. Much of the area between Interstate 43 and Lake Michigan is developing with residential and commercial uses. The State Highway 23 corridor provides a growth corridor from Fond du Lac to Sheboygan. In Manitowoc County, I-43 also forms a boundary between the urbanizing area and the rural portions of the county. The cities of Manitowoc and Two Rivers are located on the eastern edge of the county along Lake Michigan and are the primary commercial and industrial centers within the county. Much of the rest of the county is composed of rural farms and small residential areas. Kewaunee County is the most rural of the three counties in the study area and is predominantly agricultural. The cities of Kewaunee and Algoma are smaller communities with little new development.

ROADS AND HIGHWAYS

Much of the study area is developed with a significant number of roads crossing the area (Map 18). Interstate Highway 43 is the major highway through the area. I-43 separates the cities of Manitowoc, Two Rivers and Sheboygan from the western portions of the study area. Other major highways include State Highways 23, 28 and 57 in Sheboygan County, US Highways 10 and 151 and State Highways 310 and 42 in Manitowoc County, and State Highways 29 and 54 in Kewaunee County. Of these highways, only Highway 42 runs north to south within the area. The other highways are east-west corridors that form barriers to a trail. The location of Highway 42 along Lake Michigan in eastern Manitowoc and Kewaunee Counties provides an opportunity for it to be used as a corridor for access to Lake Michigan. The primarily agricultural landscape is criss-crossed with roads approximately every one to two miles apart.

DEMOGRAPHICS

Historical Population Levels

The population of the three counties in the study area has increased from 197,915 persons in 1970 to a total of 215,720 persons in 2000, an increase of 17,805 persons (Table 6). During the period 1990 to 2000, the area's growth rate was recorded at 6.17 percent which was slightly lower than the state rate of 9.65 percent. As shown in Table 6, all areas have been increasing in population since 1970 with Sheboygan County showing the greatest increase in population during this period (Map 19).

Table 6: Historic Population Levels, 1900-2000, Study Area

					Percent Change		
	Census				1970-	1980-	1990-
County	1970	1980	1990	2000	1980	1990	2000
Kewaunee	18,961	19,539	18,878	20,187	3.05	-3.38	6.93
Manitowoc	82,294	82,918	80,421	82,887	0.76	-3.01	3.07
Sheboygan	96,660	100,935	103,877	112,646	4.42	2.91	8.44
Study Area	197,915	203,392	203,176	215,720	2.77	-0.11	6.17
Wisconsin	4,417,821	4,705,335	4,891,769	5,363,675	6.51	3.96	9.65

Source: U.S. Bureau of the Census, Census of Population and Housing for the years cited; and Bay-Lake Regional Planning Commission, 2003.

Population Trends and Forecasts

According to Wisconsin Department of Administration (WDOA) Demographic Services Center projections prepared for counties in November 2003, the three counties in the study area are expected to increase in population by a projected 23,137 persons from 2000 to 2020.

Table 7: Population Projections, 2000-2020

Area	2000	2005	2010	2015	2020	Number Change	Percent Change
Kewaunee	20,187	20,765	21,343	21,909	22,457	2,270	11.2%
Manitowoc	82,887	84,574	86,307	88,055	89,860	6,973	8.4%
Sheboygan	112,646	116,070	119,411	122,921	126,540	13,894	12.3%
Study Area	215,720	221,409	227,061	232,885	238,857	23,137	10.7%
Wisconsin	5,363,675	5,563,896	5,751,470	5,931,386	6,110,878	747,203	13.9%

Source: US Bureau of the Census, 2000; Wisconsin Dept. of Administration, Demographic Services Center, Official Population Projections, 2003; and the Bay-Lake Regional Planning Commission, 2003.

Median Age

For the period 1970 to 2000, the median age for the area has been steadily increasing. In general, the population of the entire U.S. is expected to continue to shift to an increasing older population. This national trend of an aging population should be noted when planning for future needs. There will most likely need to be adjustments in the housing stock, labor force, transportation, health care, as well as many other areas.

Table 8: Median Age, 1970-2000

Geographic Area	1970	1980	1990	2000
Kewaunee County	26.9	29.3	33.7	37.5
Manitowoc County	27.8	30.2	34.6	38.3
Sheboygan County	29.0	30.3	33.8	36.8
State of Wisconsin	27.2	29.4	32.9	36.0

Source: US Bureau of the Census, Census of Population, *General Population Characteristics*, Wisconsin, 1970 Tables 33, 35; 1980 Table 44; 1990 STF 1A, General Profile, Census 2000; and Bay-Lake Regional Planning Commission, 2003.

MAPS

Map 1: Location Map

Map 2: Ecological Landscapes

Map 3: Bedrock Geology

Map 4: Pleistocene Geology

Map 5: Landforms

Map 6: General Soils

Map 7: Prime Agricultural Lands

Map 8: Watersheds

Map 9: Lakes

Map 10: Major Rivers & Streams

Map 11: Wetlands

Map 12: Landforms

Map 13: Parks and Recreational Sites

Map 14: Scientific and Natural Areas

Map 15: Environmental Corridors

Map 16: Land Cover

Map 17: Major Historical & Archeological Sites

Map 18: Major Roads

Map 19: Population